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СЦЕНАРИЙ ЭНЕРГЕТИКИ И НОРМАТИВНЫЕ ТРЕБОВАНИЯ ДЛЯ СЕКТОРА ЯДЕРНОЙ ЭНЕРГЕТИКИ В БАНГЛАДЕШ

ENERGY SCENARIO & REGULATORY REQUIREMENTS FOR NUCLEAR POWER SECTOR IN BANGLADESH

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Аннотация: Бангладеш является страной с моноструктурной энергетикой. Около 64,4% электроэнергии вырабатывается из газа, в то время как уголь составляет 3% от общего объема производства, а остальные источники - нефть (25%), уголь (2%) и возобновляемая энергия (3,6%). В докладе описаны нормативные потребности Бангладеш в выборе площадки для атомных электростанций с акцентом на радиационную безопасность и радиационную защиту с точки зрения охраны окружающей среды. Чтобы уточнить критерии пригодности в процессе отбора и помочь в окончательном процессе принятия решений, предлагается система управления подпрограммами. В этом документе также изложены требования к участку и процесс выбора площадки на основе правил безопасности МАГАТЭ и Комиссии по атомной энергии Бангладеш (BAEC). Кратко обсуждены требования безопасности к размещению АЭС.
Abstract: Bangladesh is presently a mono energy country as far as power generation is concerned. About 64.4% power is generated from gas, while coal contributes a meager 3% of the total generation and the rest of sources are oil (25%), Coal (2%) and renewable energy (3.6%). In this study, we outline Bangladesh regulatory necessities for nuclear power plant site selection with a clear focus on radiation safety & radiation protection as regards the site surroundings. To strengthen the suitability criteria during selection process, besides to assist in the final decision making process, subprogram management system are proposed. This paper also outlines the site requirements and site selection process on the basis of safety regulations of IAEA and Bangladesh Atomic Energy Commission (BAEC). The safety requirements for the siting of NPP were briefly discussed.
***Ключевые слова*:** атомная электростанция; МАГАТЭ; БАЭК; радиационная безопасность; нормативные потребности.
***Key words*:** nuclear power plant; IAEA; BAEC; radiation safety; regulatory necessities.

INTRODUCTION

According to the statistics Bangladesh present power generation 11265Mw (Md. Tarikul Islam 17 Nov 2015) [1]. Project activities have been initiated for this present demand of electricity by Bangladesh government, Bangladesh Atomic Energy Commission (BAEC)-in

accord with site selection guidelines by International Atomic Energy Agency (IAEA) and logistic support by Russian Federation. By the year of 2021 Bangladesh government is planning to upgrade power generation by 20000MW (BPDB) [2].Bangladesh needs massive advanced clean energy due to limited indigenous sources. About 85 million people have not access to electricity & about 50 million people are using traditional biomass fuels for cooking. Nuclear Power may be one option to mitigate this high demand of electricity. Basically Nuclear Power was identified as variable proposition for Bangladesh as early as 1960's [3] .According to World Bank and Bangladesh Bureau of statistics 90.2% have access in urban areas and only 42% have access in rural areas [4]. The electricity supply is not reliable, however load shedding is scheduled. 59.6% of the Bangladesh population is connected to the electricity grid (BPDB) [5]. In 2016 the total number of consumers connected to the grid is 21.8 million. Out of the 21.8 million 16 million are domestic connections (households), which would represent roughly 50% of all Bangladeshi households. Another 15% of the households have access to off-grid electricity. The government is estimating that more than 70% of Bangladeshi households now have access to electricity (June 2016) [6]. The government is planning to connect 98% of households mainly through grid extension by 2021. According to the BAEC a number of feasibility studies have been conducted, each of which established that the project site is technically and economically feasible.

ENERGY PICTURE & IMPLEMENTATION ORGANIZATIONS

In order to extenuate the present demand of electricity Bangladesh is likely to deploy nuclear energy for a diversified energy mix. Towards the realization of the nuclear power program Bangladesh has commenced essential activities regarding nuclear infrastructure, regulatory systems and so on. As Bangladesh depends for the energy supply mostly on natural Gas and Oil, so to reduce the dependence on mono energy source Bangladesh is preparing for establishment of nuclear power. BAEC-Bangladesh Atomic Energy Commission, this organization is playing a major role for the establishment of planned nuclear power project. In addition to the nuclear power program, BAEC focused its efforts on research and applications agriculture, food, medicine, industry and environment ensuring nuclear safety and radiation protection .The pre project actions are being spearheaded by the BAEC and the Nuclear Energy Programme Implementing Organization (NEPIO) with ministry of science and technology (MOSCT).

Table1: Present fuel mix of power generation (FY2015) [7]

Primary Energy Sources	Generation Capacity (MW)	Share
Natural gas	7254.66	64.4%
Oil (HSD +HFO)	2816.25	25%
Coal	225.3	2%
Imported	563.25	3.6%
Renewable Energy	405.54	3.6%
Total	11265 MW	100%

Table 2: Future Plan (According to PSMP2010) Fuel Mix by FY2030

Primary energy sources	Generation Capacity (MW)	Share
GAS/LNG	8850	22.87%
Domestic Coal	11250	29.07%
Imported Coal	8400	21.71%
Nuclear Energy	4000	10.34%
Regional grid	3500	9.04%
Others	2700	6.98%
Total	38700 MW	100%

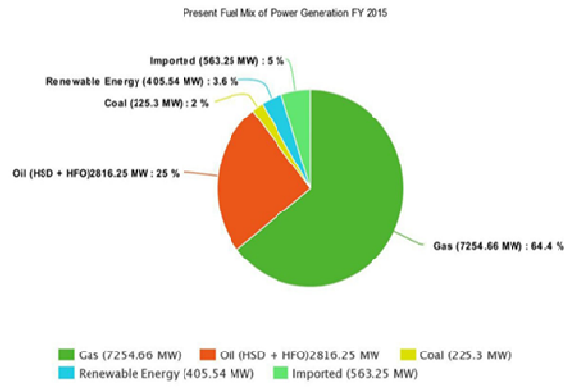

Fig. 1. Present Fuel Mix of Power Generation FY2015

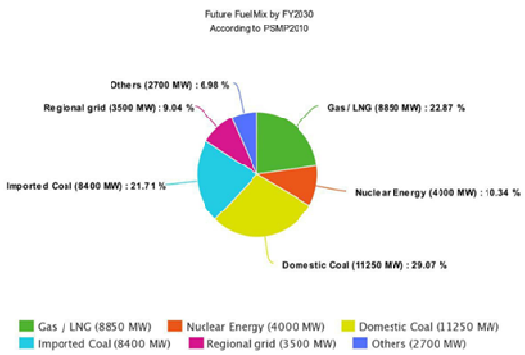

Fig. 2. future Fuel Mix Plan by 2030 (PSMP2010)

The selection of an appropriate site is very crucial process, the physical context and environmental disciplines obviously affecting safety. The fundamental safety objective is to protect individuals and the environment against the harmful effects of ionizing radiation (IAEA 1999, 2006). Site selection procedure mainly is controlled by the local regulatory body and operating organization. However, some fundamental factors for example economic interest, public relations and safety must be followed, where site is understood to be the area within which a nuclear power plant is located and which is under the effective control of the operating organization.

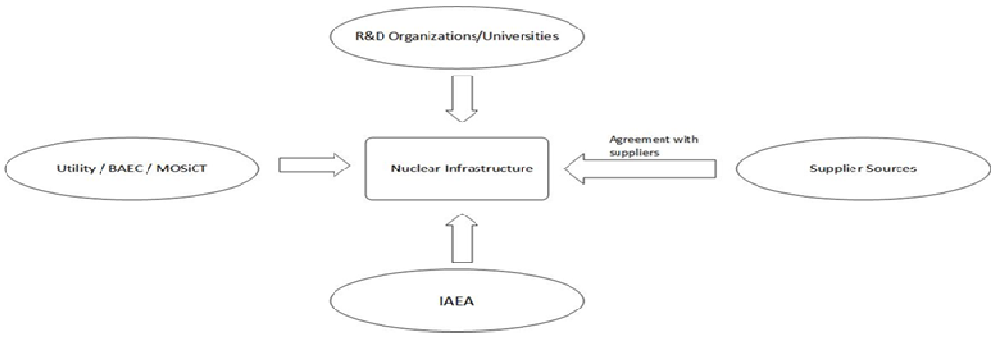

Fig 3: IAEA role in establishing nuclear infrastructure

CONCLUSION

The accessibility of electricity at an affordable price promotes the physical quality of life, enhances creation of job opportunities and virtually influences the progress of all social and economic dimensions. The development of Bangladesh certainly depends on sustainable and affordable supply of electricity in a demandable manner at a reasonable price compatible with demand. The alternative to development is suffering, poverty, misery, disease and death. Every aspects of development - from reducing poverty to improving health care, communication, transportation, food supply and preservation, housing, industrial and agricultural productivity and even all forms of happiness and affluence and rest and recreation – require adequate supply and availability of electricity. This is why Bangladesh should choose alternative sustainable source of energy for the better economy energy scenery.

REFFERENCES:

[1] Md. Tarikul Islam , Dr. Md. Rafiqul Islam, 17 Nov 2015- A paradigm shift in Bangladesh energy sector towards SDG-7: A few insights of energy statistics in Bangladesh.
[2] BPDB-Bangladesh Power Development Board
[3] A holistic approach for establishing nuclear power infrastructure in Bangladesh, 8 – 11 February 2011,

TM/WS on Topical Issues on Infrastructure Development-Vienna, Austria
[4] Worldbank: http://data.worldbank.org/indicator/EG.ELC.ACCS.ZS
[5] BPDB-Bangladesh Power Development Board
[6] Government Bangladeh: Bangladeshis Power Sector at a glance (May 2015) 2016
[7] Md. Tarikul Islam , Dr. Md. Rafiqul Islam, 17 Nov 2015- A paradigm shift in Bangladesh energy sector towards SDG-7: A few insights of energy statistics in Bangladesh.